

WHAT IS CLAIMED IS:

1. A method of producing a higher quality
5 electromyographic signal describing myoelectrical activity of an electrically active region of a subject's muscle, comprising:

sensing through an array of electrodes a plurality of EMG signals representative of the myoelectrical activity of the electrically active region of the subject's muscle;

10 applying a weighting function to the detected EMG signals and thereby producing weighted signals, the weighting function containing correction features for the relative locations of the electrically active region and the electrodes; and

15 combining the weighted signals and thereby producing the higher quality electromyographic signal.

2. A method of producing a higher quality electromyographic signal as defined in claim 1, wherein:

20 the electrically active region of the subject's muscle comprises a center;

the electrodes are separated from the center of the electrically active region by respective distances;

the electrodes are separated from each other by an inter-electrode distance; and

25 the weighting function comprises correction features for:

- the relative location of the center of the electrically active region and the electrodes;
- the distance separating the center of the electrically active region and the electrodes;
- the size of the electrically active region; and
- the inter-electrode distance.

3. A method of producing a higher quality electromyographic signal as defined in claim 1, wherein the weighting function comprises correction features for both cancellation and distance damping effects.

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4. A method of producing a higher quality electromyographic signal as defined in claim 1, wherein the electrically active region of the subject's muscle comprises a center, the array of electrodes comprises a series of electrodes with an inter-electrode distance, each EMG signal is detected through at least two electrodes of the array, and wherein applying the weighting function comprises:

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detecting the position of the center of the electrically active region about the array of electrodes;

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relating the weighting function to the position of the center of the electrically active region with respect to the electrodes of said series;

weighting each EMG signal by means of the weighting function related to the position of the center of the electrically active region with respect to the electrodes of said series.

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5. A method of producing a higher quality electromyographic signal as defined in claim 4, wherein the series of electrodes has a center, and wherein, when the center of the electrically active region is offset with respect to the center of the series of electrodes:

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a larger number of EMG signals are detected by the electrodes on one side of the center of the electrically active region than on the other side of said center of the electrically active region so that EMG signals are missing on said other side; and

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weighting of the EMG signals comprises replacing the missing EMG signals on said other side by corresponding EMG

signals from said one side and subsequently weighting said replacement EMG signals.

5 6. A method of producing a higher quality electromyographic signal as defined in claim 1, wherein combining the weighted signals comprises:

adding a feature of the weighted signals together.

10 7. A method of producing a higher quality electromyographic signal as defined in claim 1, wherein combining the weighted signals comprises;

calculating a mean of a feature of the weighted signals.

15 8. A method of producing a higher quality electromyographic signal as defined in claim 1, further comprising, prior to combining the weighted signals, evaluating electromyographic quality of the weighted signals.

20 9. A method of producing a higher quality electromyographic signal as recited in claim 8, wherein evaluating electromyographic quality comprises applying to the weighted signals quality indexes for detection of at least one of the following parameters:

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- signal-to-noise ratio;
 - maximum-to-minimum drop in power density;
 - power spectrum deformation;
 - electrical activity related to electrocardiogram/esophageal peristalsis.

30 10. A method of producing a higher quality electromyographic signal as recited in claim 8, wherein the electrically active

region of the subject's muscle comprises a center, and wherein evaluating electromyographic quality comprises adding to each other two of the weighted signals detected through respective electrodes situated on opposite sides of the center of the electrically active region to produce a corresponding addition
5 signal, subtracting said two weighted signals from each other to produce a corresponding subtraction signal, and comparing said addition and subtraction signals, said comparison being representative of the electromyographic quality of the weighted signals.

10 11. A method of producing a higher quality electromyographic signal as recited in claim 8, further comprising, prior to combining the weighted signals, replacing the weighted signals whose evaluated quality is insufficient.

15 12. A method of producing a higher quality electromyographic signal as recited in claim 11, comprising replacing the weighted signals whose evaluated quality is insufficient by predicted values.

20 13. A method of producing a higher quality electromyographic signal as recited in claim 11, comprising replacing the weighted signals whose evaluated quality is insufficient by a last value of said weighted signals considered as containing electromyographic information.

25 14. A method of producing a higher quality electromyographic signal as recited in claim 8, comprising replacing the higher quality electromyographic signal in response to weighted signals of insufficient quality.

30 15. A system for producing a higher quality electromyographic signal describing myoelectrical activity of an electrically active region of a subject's muscle, comprising:

an array of electrodes for sensing a plurality of EMG signals representative of the myoelectrical activity of the electrically active region of the subject's muscle;

5 a weighting filter applied to the detected EMG signals to produce weighted signals, the weighting filter containing correction features for the relative locations of the electrically active region and the electrodes; and

10 a combiner of the weighted signals, the combined weighted signals constituting the higher quality electromyographic signal.

16. A system for producing a higher quality electromyographic signal as defined in claim 15, wherein:

the electrically active region of the subject's muscle comprises a center;

15 the electrodes are separated from the center of the electrically active region by respective distances;

the electrodes are separated from each other by an inter-electrode distance; and

20 the weighting filter comprises correction features for:

- the relative location of the center of the electrically active region and the electrodes;
- the distance separating the center of the electrically active region and the electrodes;
- the size of the electrically active region; and
- 25 – the inter-electrode distance.

17. A system for producing a higher quality electromyographic signal as defined in claim 15, wherein the weighting filter comprises correction features for both cancellation and distance damping effects.

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18. A system for producing a higher quality electromyographic signal as defined in claim 15, wherein:

the electrically active region of the subject's muscle comprises a center;

5 the array of electrodes comprises a series of electrodes with an inter-electrode distance;

each EMG signal is detected through at least two electrodes of the array; and

10 the weighting filter comprises a weighting function related to the position of the center of the electrically active region with respect to the electrodes of said series.

19. A system for producing a higher quality electromyographic signal as defined in claim 15, wherein the series of
15 electrodes has a center, and wherein, when the center of the electrically active region is offset with respect to the center of the series of electrodes:

a larger number of EMG signals are detected by the electrodes on one side of the center of the electrically active region than on the other side of said center of the electrically active region so
20 that EMG signals are missing on said other side; and

the system comprises means for replacing the missing EMG signals on said other side by corresponding EMG signals from said one side, and means for subsequently weighting said replacement EMG signals.

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20. A system for producing a higher quality electromyographic signal as defined in claim 15, wherein the combiner comprises:

an adder of a feature of the weighted signals.

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21. A system for producing a higher quality electromyographic signal as defined in claim 15, wherein the combiner comprises:

a calculator of a mean of a feature of the weighted signals.

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22. A system for producing a higher quality electromyographic signal as defined in claim 15, further comprising, prior to combining the weighted signals, an evaluator of an electromyographic quality of the weighted signals.

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23. A system for producing a higher quality electromyographic signal as recited in claim 22, wherein the evaluator comprises means for applying to the weighted signals quality indexes for detection of at least one of the following parameters:

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- signal-to-noise ratio;
- maximum-to-minimum drop in power density;
- power spectrum deformation;
- electrical activity related to electrocardiogram/esophageal peristalsis.

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24. A system for producing a higher quality electromyographic signal as recited in claim 22, wherein the electrically active region of the subject's muscle comprises a center, and wherein the evaluator comprises an adder of two of the weighted signals detected through respective electrodes situated on opposite sides of the center of the electrically active region to produce a corresponding addition signal, a subtractor of said two weighted signals from each other to produce a corresponding subtraction signal, and a comparator of said addition and subtraction signals, this comparison being representative of the electromyographic quality of the weighted signals.

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25. A system for producing a higher quality electromyographic signal as recited in claim 22, further comprising means for replacing, prior to combining the weighted signals, the weighted signals whose evaluated quality is insufficient.

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26. A system for producing a higher quality electromyographic signal as recited in claim 25, comprising means for replacing the weighted signals whose evaluated quality is insufficient by predicted values.

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27. A system for producing a higher quality electromyographic signal as recited in claim 25, comprising means for replacing the weighted signals whose evaluated quality is insufficient by a last value of said weighted signals considered as containing electromyographic information.

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28. A system for producing a higher quality electromyographic signal as recited in claim 22, comprising means for replacing the higher quality electromyographic signal in response to weighted signals of insufficient quality.

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